

## THREE NEW SPECIES OF *PSEUDACHORUTES* (COLLEMBOLA: NEANURIDAE: PSEUDACHORUTINI) FROM CHINA<sup>1</sup>

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**ABSTRACT:** The genus *Pseudachorutes* is recorded for the first time from China, with three new species: *P. lishanensis*, *P. jianxiucheni* and *P. wandae*, all of them are from LiShan Mountain, Shaan Xi Province, Northwest China. *Pseudachorutes lishanensis* n. sp. is easy to distinguish, having two kinds of setae (macrosetae and microsetae) and mandible with three teeth. *Pseudachorutes jianxiucheni* n. sp. has 11-15 vesicles in the postantennal organ, mandible with 4-5 teeth, a relatively small body size, and tenent hair on tibiotarsi. *Pseudachorutes wandae* n. sp. has minute body setae and long sensorial setae; postantennal organ composed of 16-18 simple vesicles, and very small size. The new taxa are described and illustrated.

**KEY WORDS:** Collembola, Neanuridae, Pseudachorutini, taxonomy, China

*Pseudachorutes* is a large genus with 94 species described all over the world (Christiansen and Bellinger, 1998; Fjellberg, 1998), but none have been recorded from China before (Zhao et al., 1997). During our ongoing study on the biodiversity of North-West China, we collected three new species from LiShan Mountain, Shaan Xi province which are described in this paper.

All specimens studied for this contribution are deposited at the Insect Specimen Gallery, Institute of Plant Physiology and Ecology, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences. Abbreviations used in this paper are: Ant. = antennal segment; Abd. = abdominal segment; PAO = postantennal organ; sgd = dorsal guard sensillum; sgv = ventral guard sensillum; Th. = thoracic segment.

### SYSTEMATIC ENTOMOLOGY

#### *Pseudachorutes lishanensis* NEW SPECIES

Figs. 1-10

**Material Examined:** Holotype: male mounted specimen, Northwest China, Shaanxi Province, LiShan Mountain, 100 m altitude, litter-rich soil in forest, 7 /VI / 2006, Yun-Xia Luan, Yun Bo, Yan Gao leg. Paratypes: 2 pre-adult females, 1 male and 4 juvenile mounted specimens, same data as Holotype.

**Description:** Body length (n=8): 845  $\mu$ m (range: 780-1000 $\mu$ m). Body color dark gray. Granulations big and homogenous. Body setae simple and smooth, but with two kinds of setae, long macrosetae (42 – 62  $\mu$ m) and short microsetae (12 – 25  $\mu$ m), the sensorial setae relatively short (25 – 30  $\mu$ m, Fig. 1).

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Antennae 0.75 as long as head. Antennal segment I with 7 setae, antennal segment II with 12 setae. Antennal segments III and IV fused dorsally. Antennal segments ratio I: II: III+IV as 1: 1: 2. Antennal III-organ with two small straight internal sensilla covered by a cuticular fold, two guard sensilla (the sgv is about 1.5 times as long as sgd) and one microsensillum close to ventral guard sensillum. Ant. IV with trilobed apical bulb, six cylindrical sensilla, seta "i", subapical organite (Fig. 2-3), ventral file poorly developed (Fig. 3).

Postantennal organ elliptical composed of 8-12 simple vesicles, 1.1 times larger than nearest ocelli (Figs. 7). Eye patch with 8+8 small ocelli (Fig. 7), F, G 0.9 times smaller than others.

Buccal cone elongated. Mandible with three slender teeth (Fig. 6). Maxilla styliform, with two blades, one of which has an apical tooth (Fig. 5). Labium with normal chaetotaxy of the genus with setae A-G and three lateral setae, 1+1 setae L on a small tubercle (Fig. 4).

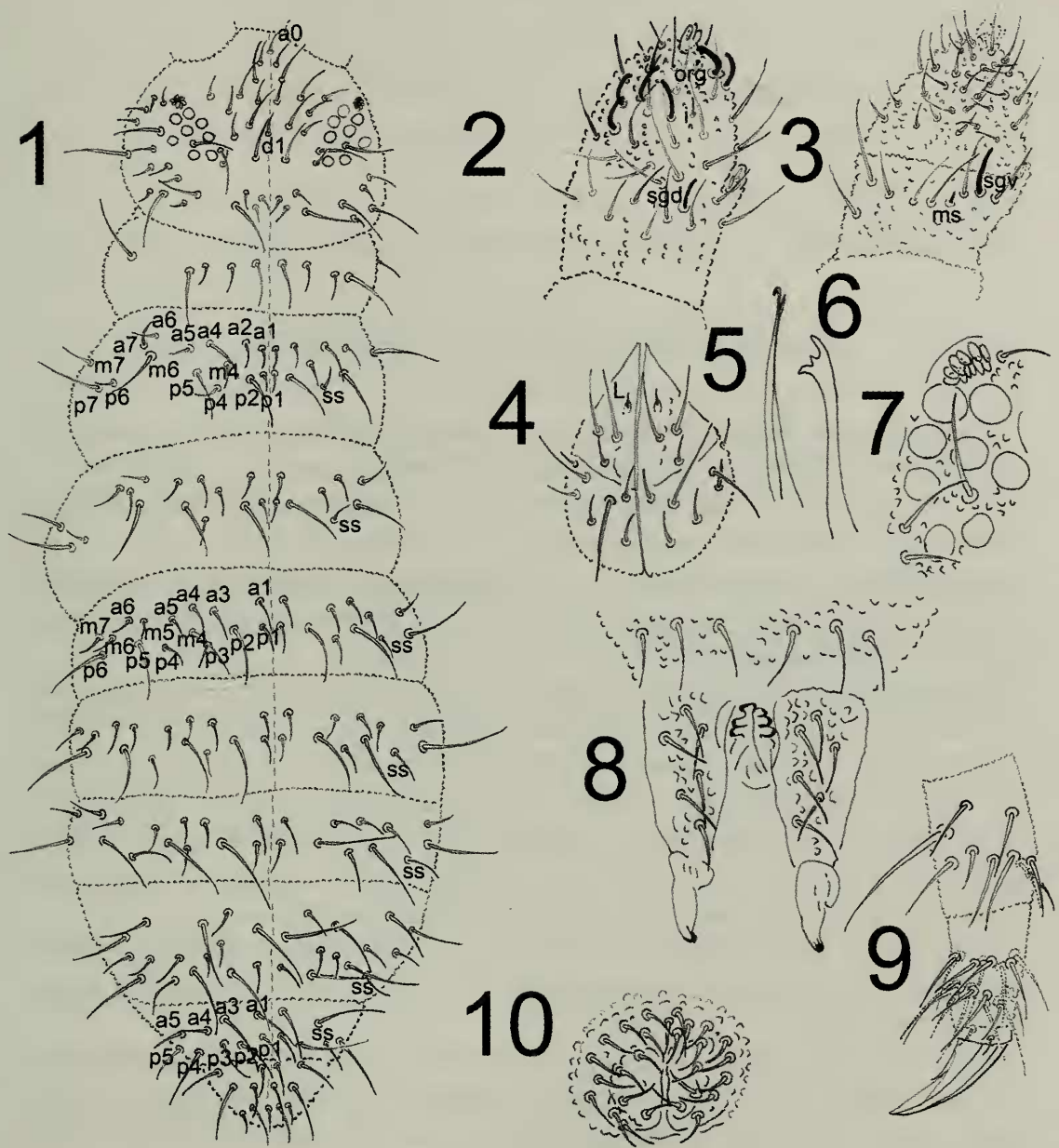
Dorsal chaetotaxy as in Fig. 1. Seta a0 on the head present, unpaired seta d1 present. Th. I with 4+4 dorsal setae and one on each subcoxa 1. Setae a2 present on Th. II, but absent from Th. III to Abd. V. Setae m4 and a6 present. Sensory setae s on the body in position of p4 and m7 on Th. II and Th. III, p4 from Abd. I to IV and p3 on Abd. V. Sensorial formula of the body 022/11111. Sensory setae s subequal to ordinary short setae, but more slender. Ratio of largest Abd. V setae to inner unguis length is 2.0. Thoracic sterna without setae. Ventral tube with 4+4 setae on the body. Male genital plate with 3+3 pregenital setae, 18-21 circumgenital setae and 4+4 eugenital setae (Fig. 10).

Tibiotarsi I, II, III with 19, 19, 18 setae respectively, without tenent hairs. Unguis wide with one inner tooth near basal 1/3, and a weak lateral tooth. Ratio of tibiotarsus III to unguis about 1.1. Unguiculus absent (Fig. 9). Femur I, II, III with 11, 11, 10 setae respectively. Trochanters with five setae each. Coxae I, II, III with 3, 7, 7 setae respectively. Subcoxae 2. I, II, III with 0, 3, 3 setae respectively. Subcoxae 1. I, II, III with 1, 3, 3 setae respectively.

Furcula well developed. Dens dorsally with six setae and strong granulation. Mucro as half as dens length, boat-shaped, with a large badal bladder-like swelling visible and a hook-like tip (Fig. 8). Tenaculum with 3+3 teeth (Fig. 8).

**Remarks:** This new species resembles *P. conicus* Lee and Kim, 1994, by its heterochaetosis, mandible with three teeth, dens with six setae and tenaculum with 3+3 teeth. *P. chazeaui* Najt and Weiner, 1991 and *P. longisetis* Yosii, 1961 also have such characters as mandible with three teeth, dens with six setae and tenaculum with 3+3 teeth. Main differences between them can be seen in Table 1. In addition, *P. conicus* has a very long and thin unguis, but in *P. lishanensis* n. sp. it is short and thick.

**Etymology:** The name of the new species is after the type locality: LiShan Mountain from China.



Figs. 1-10. *Pseudachorutes lishanensis* n. sp.: 1. Dorsal chaetotaxy. 2. Antennal segments III-IV of right antenna, dorsal view. 3. Antennal segments III-IV of right antenna, ventral view. 4. Labium. 5. Maxilla. 6. Mandible. 7. Ocular area and postantennal organ, right. 8. Furcula and tenaculum. 9. Femur and Tibotarsus III. 10. Male genital plate.



Table 1. Main differences between *P. lishanensis* n. sp. and similar species

Characters	<i>P.</i> <i>conicus</i>	<i>P. lishanensis</i> n. sp.	<i>P.</i> <i>chazeaui</i>	<i>P.</i> <i>longisetis</i>
Labium setae L	-	+	+	?
Ant. IV sensilla	7	6	7	6
PAO vesicles number	13-15	8-12	13-17	10
Ventral tube setae	3+3	4+4	4+4	?
Maxilla lamellae	3	2	2	1
Lateral unguis tooth	-	1	3	-

*Pseudachorutes jianxiucheni* NEW SPECIES

Figs. 11-20

**Material Examined:** Holotype: female mounted specimen, from Northwest China, Shaanxi Province, LiShan Mountain, 100 m altitude, litter-rich soil in forest, 7 /VI / 2006, Yun-Xia Luan, Yun Bo, Yan Gao Leg. Paratypes: 2 females, 2 males and 8 juveniles mounted specimens, same data as Holotype.

**Description:** Body length (n=13): 820 μm (range: 650-1050 μm). Body color dark gray. Granulation homogenous. Body setae short and smooth (12 – 17 μm), longer on Abd. VI (25 μm). Sensorial setae about 25 μm.

Antennae 0.8 times head length. Ant. I with seven setae, Ant. II with 12 setae. Ant. III and IV dorsally fused. Antennal segments ratio I: II: III+IV as 1: 1: 2. Ant. III-organ with two curved microsensilla covered by a cuticular fold, two large guard sensilla (the sg<sub>v</sub> is about 1.3 times as long as sg<sub>d</sub>), and 1 microsensillum close to the ventral guard sensillum (Figs.12-13). Ant. IV with trilobed apical bulb, 6 cylindrical sensilla, seta “i”, dorsoexternal microsensillum and one subapical organite. Ventral “file” with 10-15 straight short setae (Fig. 12-13).

Postantennal organ elliptical composed of 11-15 simple vesicles, 1.3 times larger than nearest ocelli. Eye patch with 8+8 small ocelli, F, G are 0.9 times smaller than others.

Buccal cone elongated. Mandible with four teeth (Fig. 14). Maxilla styliform, with two blades, one of which carries two apical teeth (Fig. 15). Labium with typical genus chaetotaxy of the genus with setae A-G and three lateral setae, Setae L1+1, straight, short and without tubercle (Fig. 16).

Dorsal chaetotaxy as in Fig. 11. Seta a<sub>0</sub> on the head present, unpaired seta d<sub>1</sub> present. Th. I with 5+5 dorsal setae and one seta on each subcoxa 1. Setae a<sub>2</sub> present on the Th. II, but absent from Th. III to Abd. V. Sensory setae on the body in position of p<sub>4</sub> and m<sub>6</sub> on the Th. II and III, and p<sub>4</sub> from Abd. I to IV and p<sub>2</sub> on Abd. V. Sensorial formula of the body 022/11111. Sensorial setae 1.5-2.5 times longer than short ordinary setae. Ratio of the largest Abd. V seta to inner unguis length is 0.5. Thoracic sterna without setae. Ventral tube with 4+4 setae

on the body. Male genital plate with 3+3 pregenital setae, eight circumgenital setae and 4+4 eugenital setae (Fig. 19). Female genital plate with 3+3 pregenital, 10 circumgenital and 1+1 eugenital setae (Fig. 20).

Tibiotarsi I, II, III with 19, 19, 18 setae respectively, with one acuminate dorsal tenent hair. Unguis with one inner tooth at 1/3 from the basal part. Unguiculus absent (Fig. 18). Femur I, II, III with 11, 11, 10 setae respectively. Trochanters with five setae each. Coxae I, II, III with 3, 7, 7 setae respectively. Subcoxae 2. I, II, III with 0, 2, 2 setae respectively. Subcoxae 1. I, II, III with 1, 3, 3 setae respectively.

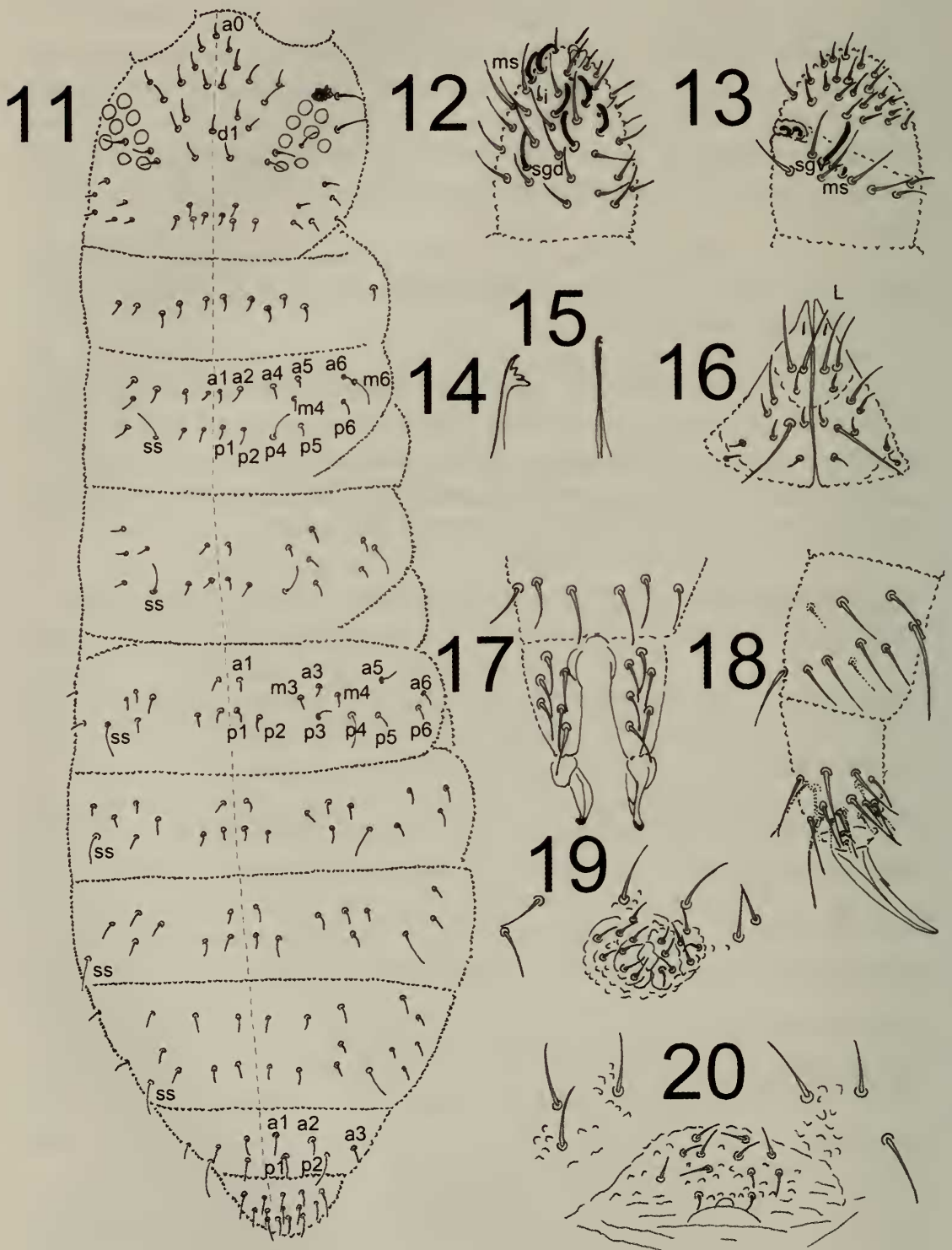
Furcula well developed. Dens with six dorsal setae. Mucro half of the dens, boat-shaped, with two long basal bladder-like swellings and a hook-like tip (Fig. 17). Tenaculum with 3+3 teeth.

**Remarks:** *Pseudachorutes jianxiucheni* n. sp. resembles *P. isawaensis* Tamura, 2001, *P. simplex* Maynard. 1951 and *P. subcrassoides* Mills, 1934 (Stach, 1949), all of them with 11-15 vesicles in the PAO and mandible with 4-5 teeth. However, we can see the differences among them in Table 2.

**Etymology:** The new species is dedicated to Dr. Jian-Xiu Chen, Nanjing University, China for his contribution to Chinese Collembola.

Table 2. Characters distinguishing *P. jianxiucheni* n. sp. and similar species

Characters	<i>P. isawaensis</i>	<i>P. simplex</i>	<i>P. jianxiucheni</i> n. sp.	<i>P.</i> <i>subcrassoides</i>
Maximum size	1.6	2.2	1.05	1.8
Distal labium setae	3+1 L seta	?	3+1 L seta	4
Ratio dens - mucro	1.7	1.5	2	2
Setae of ventral file on Ant. IV	-	20-30	10-15	-
Maxilla lamellae	1	1	2	?
Ant. IV sensilla	5	6	6	5
Tenent hair	-	-	+	-
Mucro form	Bladder-like basal swelling	Bladder-like basal swelling	Bladder-like basal swelling	Broadly lamellate



Figs. 11-20. *Pseudachorutes jianxiucheni* n. sp.: 11. Dorsal chaetotaxy. 12. Left antennal segments III-IV, dorsal view. 13. Left antennal segments III-IV, ventral view. 14. Mandible. 15. Maxilla. 16. Labium. 17. Furcula. 18. Femur and Tibiotarsus III. 19. Male genital plate. 20. Female genital plate.

***Pseudachorutes wandae* NEW SPECIES**

Figs. 21-29

**Material Examined:** Holotype: female on slide, Northwest China, Shaanxi Province, LiShan Mountain, 100 m altitude, litter-rich soil in forest, 7 /VI / 2006, Yun-Xia Luan, Yun Bo, Yan Gao leg. Paratypes: 1 female mounted specimen, same data as holotype.

**Description:** Body length (n=2): 950-1400  $\mu\text{m}$ . Color of the body dark blue. Granulation homogenous. Body setae simple, very small (about 10  $\mu\text{m}$ ) and smooth, sensorial setae (55 – 75  $\mu\text{m}$ ) 5.5-7.5 times as long as the ordinary setae (Fig. 21). On Abd. VI setae are longer (17 – 25  $\mu\text{m}$ ). Postlabial setae (30  $\mu\text{m}$ ) and all ventral setae (50  $\mu\text{m}$ ) longer than dorsal setae.

Antennae 0.7 times headlength. Ant. I with seven setae, Ant. II with 12 setae. Antennal segments III and IV dorsally fused. Antennal segments ratio I: II: III+IV as 1.5: 2: 3. Antennal III organ with two internal curved microsensilla in a cuticular fold, two larger straight guard sensilla (the sgv is about 1.2 times as long as sgd), and one microsensillum close to ventral guard sensilla (Fig. 22-23). Antennal segment IV with trilobed apical bulb, six cylindrical sensilla seta “i”, microsensillum, one small sensorial pit (Fig. 23), without ventral file (Fig. 22). Postantennal organ with 16-18 simple vesicles arranged in an ellipse, 2.5 times larger than nearest ocelli. Eye patch with 8+8 small ocelli (Fig. 21), F, G slightly smaller than others.

Buccal cone short. Maxilla styliform, with two blades, one with an apical tooth (Fig. 25), Mandible with two large teeth (Fig. 26). Labium with 4+4 distal and 7+7 proximal setae, Setae L small, spine-like (Fig. 24).

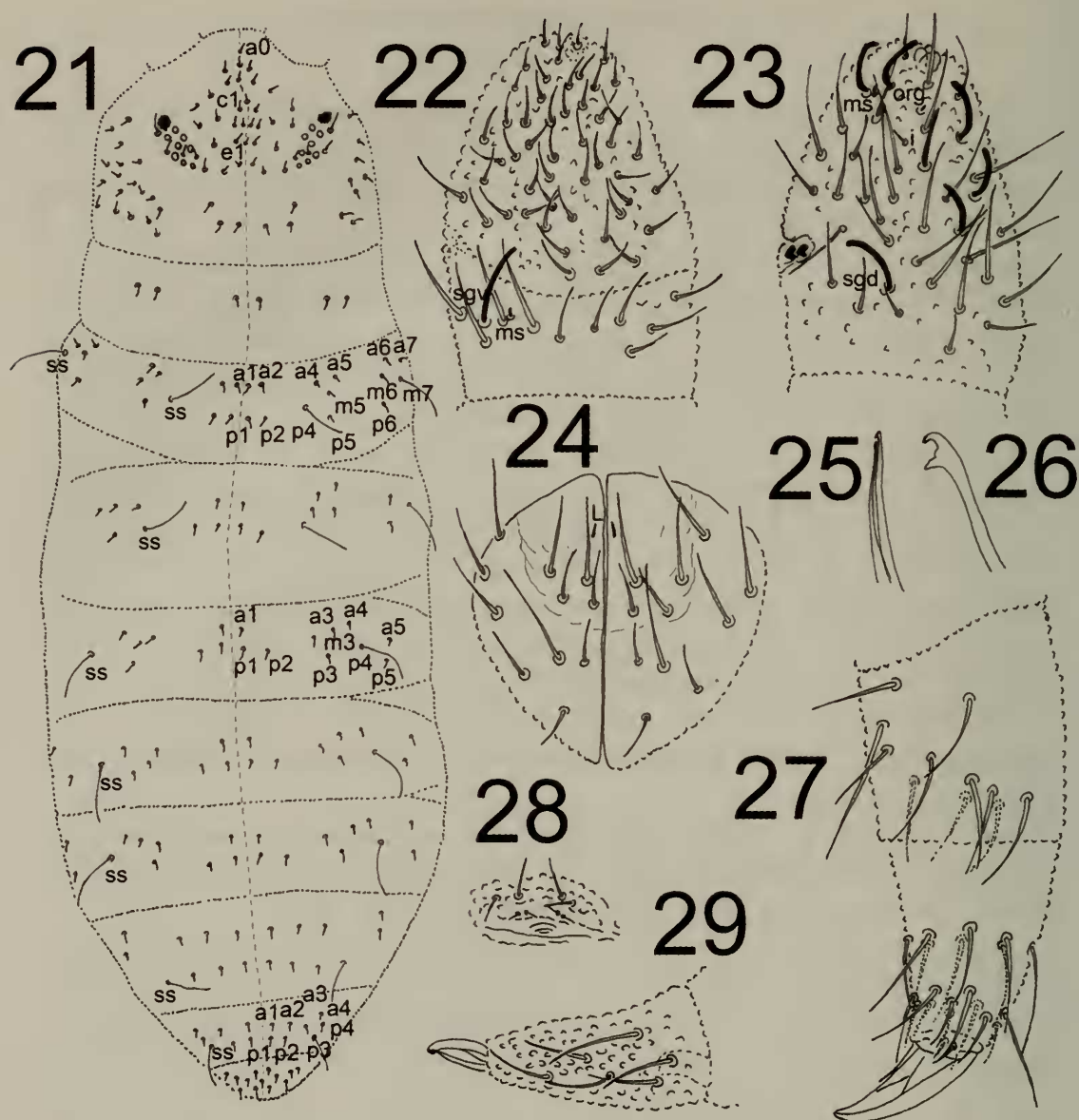
Dorsal chaetotaxy as in Fig. 21. Seta a0 on the head present, unpaired seta a1, b1, c1, e1 present. Th. I with 3+3 setae and one on subcoxa 1. Setae a2 present on the Th. II, but absent from Th. III to Abd. III. Sensory setae on the body in position of p4 and m7 on Th. II and III, p4 from Abd. I to IV and p3 on Abd. V. Sensorial formula of the body 022/11111. Sensorial setae 5.5-7.5 times as long as ordinary setae. Ratio of the largest Abd. V setae to inner unguis length is 0.3-0.4. Thoracic sterna without setae, ventral tube with 4+4 setae. Female genital plate with 2+2 circumgenital setae and 1+1 eugenital setae (Fig. 28).

Tibiotarsi I, II, III with 19, 19, 18 setae respectively, without special tenent hair. Claws with one inner tooth on the middle of the claw. Unguiculus absent (Fig. 27). Femur I, II, III with 11, 11, 10 setae respectively. Trochanters with five setae each. Coxae I, II, III with 3, 7, 8 setae respectively. Subcoxae 2. I, II, III with 0, 2, 2 setae respectively. Subcoxae 1. I, II, III with 1, 2, 2 setae respectively.

Furcula well developed. Dens with strong granulation and six dorsal setae, one of them outstanding. Mucro 1/4 the length of the dens, straight, without bladder-like swelling (Fig. 29). Tenaculum with 3+3 teeth.

**Etymology:** This species is dedicated to Dr. Wanda Weiner, from the Institute of Systematics and Evolution of Animals Polish Academy of Sciences, Krakow, Poland, for her contribution to poduromorph Collembola.





Figs. 21-29. *Pseudachorutes wandae* n. sp.: 21. Dorsal chaetotaxy. 22. Left antennal segments III-IV, ventral view. 23. Left antennal segments III-IV, dorsal view. 24. Labium. 25. Maxilla. 26. Mandible. 27. Tibiotarsus and Femur II. 28. Female genital plate. 29. Furcula.

**Remarks:** *P. wandae* n. sp. is similar to *P. andrei* Weiner and Najt, 1985 in having very small tergal microsetae. They also share the similar number of PAO vesicles, the PAO/eye ratio and the number of Ant. IV sensillae. The new species is smaller (1.25 to 1.4 mm) than *P. andrei* (1.75 – 1.85 mm). Even though both species have very short body setae, in *P. andrei* the sensorial setae are 3.5 – 4.0 times as long as ordinary setae, whereas in *P. wandae* n. sp. they are from 5.5. to 7.5 times longer. The labium in the new species has 1+1 small spine-like setae L which *P. andrei* lacks. Th. I has 3+3 setae in the new species and 4+4 in *P. andrei*.



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